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PATENT SPECIFICATION

DRAWINGS ATTACHED

845,576

Date of Application and filing Complete Specification April 15, 1957.

No. 12270/57.

Complete Specification Published Aug. 24, 1960.

Index at Acceptance:—**Class 29**, D(1A:7A:7C:7E).

International Classification:—**F25c.**

COMPLETE SPECIFICATION

Improvements in or relating to Moulds for Ice Blocks

I, FEDERICO RICHELLI, of Via Bolzano 29, Milan, Italy, of Italian nationality, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

THE PRESENT INVENTION relates to a mould for the speedy production of ice blocks.

In the past the manufacture of ice has been carried out by freezing water within moulds plunged into tanks filled with brine brought to a low temperature. More recently jacketed moulds for ice blocks have been used in which a suitable fluid is allowed to circulate and evaporate within the jacket thus lowering down to freezing point the temperature of the water filling the said moulds.

Both methods present notable drawbacks the first one in particular is quite primitive and wasteful of space, apart from being unsuitable for the hygenic production of ice.

The main criticism of the second method is the high thermal losses leading to inefficient operation, said losses being caused in the main by the considerable mass of the materials employed in known mould designs.

In view of this, one of the objects of the present invention is a mould of cheap manufacture for a safe high rate production of ice block involving very small heat absorbing masses and making use of a minimum volume of refrigerating fluid.

The invention consists of a mould for speedy production of ice blocks, in which the walls and bottom are formed each by two thin metal sheets mounted in parallel and narrow relationship, at least the inner sheet of the walls being provided with uniformly distributed shallow depressions or indentations, for example in a quincunx arrangement, the two sheets of the walls being weld-joined together along their edges and the said depressions keeping the two sheets spaced apart and defining a narrow jacket consisting of a plurality of uniformly distributed interconnected passages in which the circulating refrigerant or de-icing fluid is confined, and at least one inlet and one outlet to said passages.

Embodiments of the present invention will now be described by way of example only, with reference to the accompanying drawings, wherein:

Figures 1 to 5 illustrate a first form of embodiment, Figure 1 being a perspective view of a fully assembled mould; Figure 2 a perspective view of the plates or sheets forming the mould side walls and bottom, prior to being assembled; Figure 3 a larger scale perspective view of a portion of the mould side wall provided with a flange inwardly extending within the mould; Figure 4 a detail of Figure 3 in an exploded layout; Figure 5 a larger scale perspective view of the moulded bottom.

A modification of the embodiment of the mould according to the present invention is illustrated in Figures 6 to 14.

Figure 6 is a perspective view of the modified and fully assembled mould;

Figure 7 is a perspective view of the plates or sheets forming the mould side walls before assembly;

Figure 8 shows on a larger scale, a cross-section of the mould along the line 8-8 of Figure 6;

Figure 9 represents, also on a larger scale, a longitudinal along the line 9-9 on Figure 6;

Figure 10 is, on a larger scale, the section along 10-10 of Figure 6;

Figure 11, is a perspective view, on a larger scale, of the mould bottom before attachment thereto of the piping allowing transfer between the mould bottom and side walls;

Figures 12, 13 and 14 relate to a hollow member to be fitted to the mould bottom for the purpose hereinafter disclosed;

Figure 12 is top plan view of the hollow

[*Price 3s. 6d.*]

member;

Figure 13 is a longitudinal partly cross-sectional view along the line 13-13 on Figure 12;

Figure 14 is a partly cross-sectional view along 14-14 of Figure 13.

With reference to Figures 1 and 2, the mould illustrated as an example essentially comprises four substantially trapezoid view side walls 1, in which 2 and 3 are respectively the larger and smaller of the two parallel sides and 4 are the slanted sides. Thus a longitudinally tapered mould is provided facilitating removal of the formed ice block.

As is apparent from Figures 3 and 4, each wall according to this invention is obtained by joining together, by edge welding, metal sheet members such as for instance those designated by 5, 6, and 7 so as to define an interspace between them each of said members having slight surface depressions 8, or indentations in quincunx arrangement, extending into the interspace, these depressions on one sheet being aligned with those on the opposite sheet, said metal sheet members thus forming a jacket with passages 10, within which the refrigerant is caused to circulate. Each of the other side walls is provided with refrigerant inlet and outlet, 11 and 12 respectively, communicating with headers 15 and 16 respectively the latter being provided with suitable discharge control means 17.

Said headers 15 and 16 have union flanges 18 and 19 for connection to the refrigerant supply (not shown). Additionally the bottom member 20 is fitted with inlet pipes 21 and outlet pipes 22.

The projecting portions formed on the ice block by depressions 8 are not inconvenient on the contrary they advantageously and economically replace the reference marks purposely arranged hitherto on the surface of newly formed blocks for the purpose of enabling an estimate to be made of the weight of the ice. Said projecting portions caused by the mould according to the present invention fulfil in fact a similar purpose.

The inwardly extending flanges 23 are intended for further speeding up of ice block formation. Said flanges are constructed as more clearly illustrated in Figure 4 and are made to abut with suitable partitions 24 carried to this end, by the bottom member 20.

In Figures 6 to 14 like parts have been referenced by like numerals when compared with Figures 1 to 5, only the additional parts included in the modification are designated by new numerals.

It is to be noted that each of the four side walls of the mould has an upper edge 2 where the jacket 10 does not reach and a lower edge 3 provided with compartment 30 (see Figures 7 and 10) extending the whole width of side 3.

The bottom member 20 is constructed similarly to the mould side walls by metal sheets 5 and 6 (see Figures 10 and 11) combining to form jacket 10. The bottom number 20' is provided with sides 31, each presenting openings 32 (see Figure 11) to which suitable fittings 33 (Figure 8) are welded to form a connection with the mould side walls allowing free circulation of refrigerant of de-icing fluid. Each fitting 33 is provided with holes 34 for communication with the chamber 30 of the respective overhanging plate 1.

The freezing of de-icing fluid coming from a source (not shown), enters conduit 36, reaches header 16 and through pipes is led into bottom member 20 (Figure 10) whence through fittings 33 to compartments 30 and up through the interspace of the mould side walls to the upper compartments 38, similar to compartments 30; each compartment 38 is connected by pipe 39 to the upper header 15, the outlet 40 of which leads back to said source. According to a modification of the embodiment described the upper mould portions 2 carry an annular body 41 (Figures 6 and 9) substantially quadrangularly shaped like the mould mouth, and removed from upper chambers 38 by intervening space 42. Such hollow body 41 is provided with inlet pipe 43 and outlet pipe 44 for circulation of a relatively warm fluid, preferably water, said circulation being made possible by fitting a wall within the hollow body at a point 45 intermediate between inlet and outlet; the purpose of the modification is to ensure that the upper mould portion 2 is kept at a temperature always higher than freezing point in order to delimit upper ice formation.

With reference to Figures 8 and 11 in particular the bottom member is provided with a centre aperture 46. This aperture forms a seat for the heating body 47 shown in Figures 12, 13 and 14, said body being mounted on said seat with gasket 48 therebetween. Said body 47 is provided with a portion 49 designed to fit into seat 46. Hollow body 47 performs a function similar to that of the annular body 41; it has likewise, an inlet conduit 50 and a discharge or outlet conduit 51 in a water circuit made possible within body 47 by partition 52. This heating introduced through the heating body prevents ice adhering to projection 49, apart from ensuring de-icing of the body 47 itself.

Body 47 is provided with a centre passage 53, leading to 54 inside the mould this passage terminating in an internally chamfered portion. At its lower end passage 53 is closed by a removable plug 55, on removal of which air may be forced through the passage when crystalline ice is required. This justifies the shape of the aperture 53.

Aperture 53 however is mainly provided for performing the definitely more important function of relieving undue pressure likely to occur in the lower mould portion. To this

end, aperture 53, which is usually kept closed by plug 55, is provided with laterally branching conduit 56 which at its free end discharging to the atmosphere is fitted with a suitable adjustable relief device, such as for instance any know type of safety valve 57, the latter being normally out of operation, but acting only and always when a set pressure limit has been exceeded within the mould.

WHAT I CLAIM IS:—

1. A mould for speedy production of ice blocks, in which the walls and bottom are formed by two thin metal sheets, mounted in parallel and narrow relationship at least the inner sheet of the walls being provided with uniformly distributed shallow depressions or indentations for example in a quincunx arrangement, the two sheets of the walls being weld-joined together along their edges and the said depressions keeping the two sheets spaced apart and defining a narrow jacket consisting of a plurality of uniformly distributed interconnected passages in which the circulating refrigerant or deicing fluid is confined, and at least one inlet and one outlet to said passages.

2. A mould as claimed in Claim 1, wherein the walls are provided with inward projections assisting the freezing operation.

3. A mould as claimed in Claim 1 or Claim 2 wherein the depressions of one sheet abut the facing sheet or the depressions of the facing sheet.

4. A mould as claimed in Claim 1 or in Claim 2, wherein the depressions allow projection marks to form on the surface of the ice block.

5. A mould, as claimed in Claim 2 wherein each wall is provided with at least one hollow projection inside which said fluid is caused to pass.

6. A mould, as claimed in Claim 5, wherein said projections are of metal sheets and are constructed similarly to the mould walls.

7. A mould as claimed in any one of the preceding claims wherein inlet connections and outlet connections, for the fluid circulating through the walls, are respectively grouped by a header, there being thus provided an upper and a lower header.

8. A mould as claimed in Claim 1, comprising means to delimit ice formation; means for supplying heat to assist detachment of the ice block from the mould bottom said means being additionally adapted to guard against undue pressure being exerted on said mould bottom and to enable air to be introduced therethrough for the purpose of obtaining clear crystalline ice.

9. A mould as claimed in Claim 8, wherein the first mentioned means comprise a hollow annular quadrangularly shaped body carried by the prolonged inside sheet of the mould and removed from the upper portions of the jackets of the mould, by an intervening space, said body surrounding the mould top, said hollow body allowing circulation thereabout the relatively warm fluid through inlet and outlet openings.

10. A mould as claimed in Claim 9, wherein said fluid is preferably water.

11. A mould as claimed in Claim 10, wherein within said hollow body the water circulation is made undirectionally by providing a suitable partition between the inlet and outlet openings.

12. A mould, as claimed in any one of the preceding claims wherein the mould bottom is like the mould wall of jacketed construction.

13. A mould as claimed in any one of the preceding claims wherein at least the inner sheet of the mould bottom is provided with uniformly distributed shallow depressions or indentations.

14. A mould, as claimed in Claim 13, wherein fluid circulation within the side walls is in series with that within the mould bottom.

15. A mould as claimed in Claim 14, wherein the fluid flow is directed from the fluid source to the mould bottom, and up the side walls to the outlet leading back to the source.

16. A mould, as claimed in Claim 8, wherein said second mentioned means comprise a hollow body attached to the mould bottom, said hollow body being provided with inlet and outlet openings and an inner partition therebetween for the purpose of circulating a heating fluid, preferably water.

17. A mould, as claimed in Claim 16, wherein said hollow body, engages a seat in the mould bottom so as to allow the water to be frozen at the bottom of the mould to come directly into contact with the upper portion of said hollow body.

18. A mould, as claimed in Claims 16 and 17, wherein said hollow body provides a passage leading to the interior of the mould at one end and provided at another end with a pressure relief device.

19. A mould, as claimed in Claims 9 and 18, wherein said passage has a third end normally closed by a removable plug which on removal allows air to be forced through the mould.

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045576 COMPLETE SPECIFICATION
3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

FIG. 1

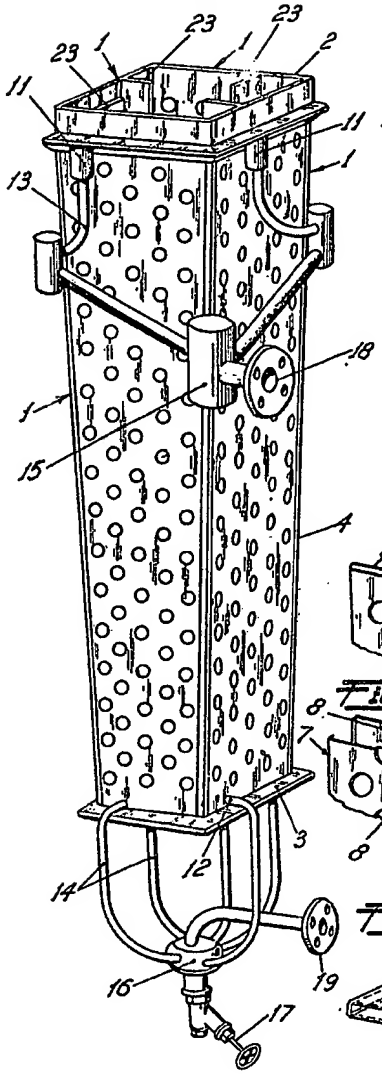


FIG. 2

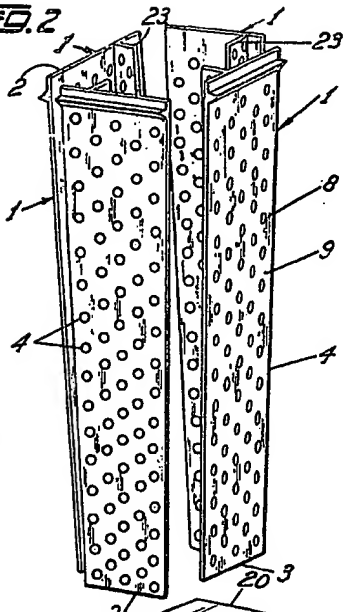


FIG. 3

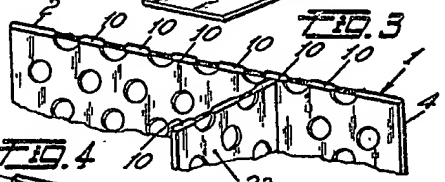


FIG. 4

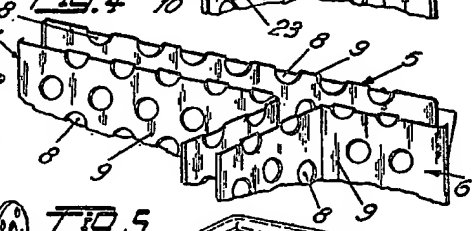


FIG. 5

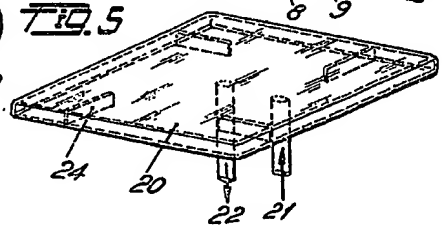


FIG. 6

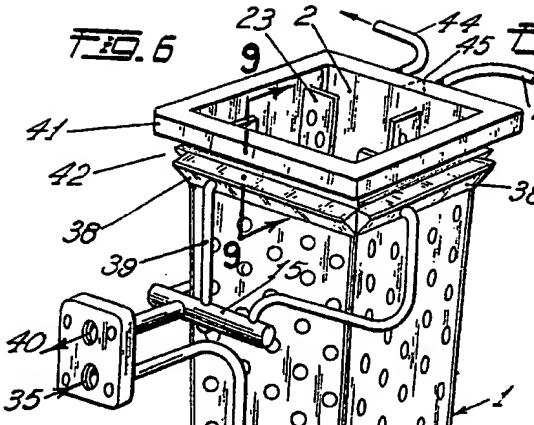


FIG. 7

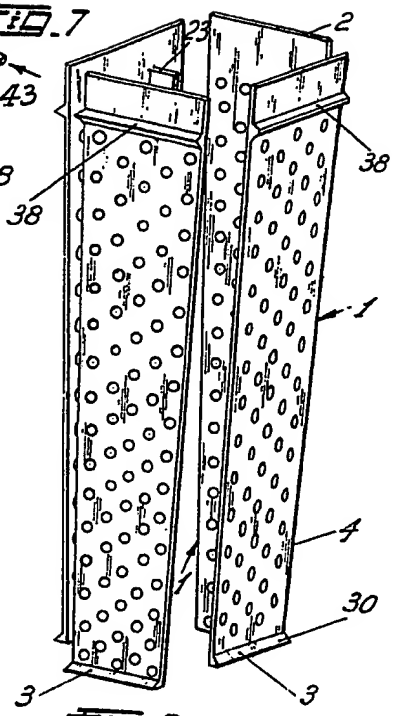


FIG. 9

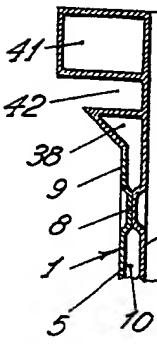


FIG. 8

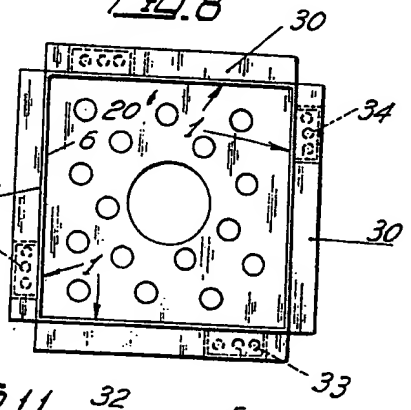


FIG. 10

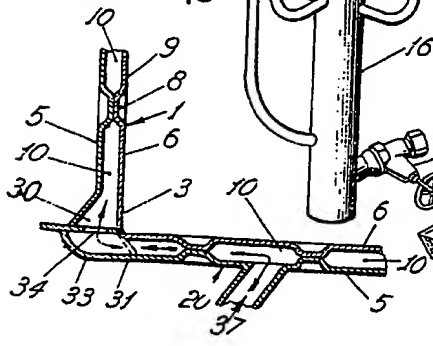
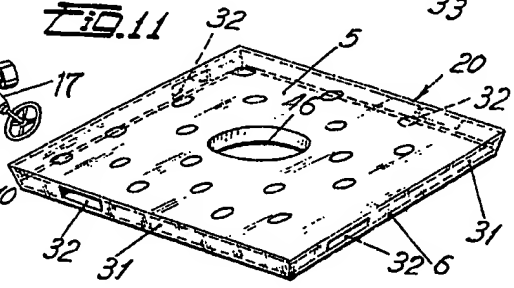


FIG. 11



13

845576 COMPLETE SPECIFICATION
3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 2 & 3

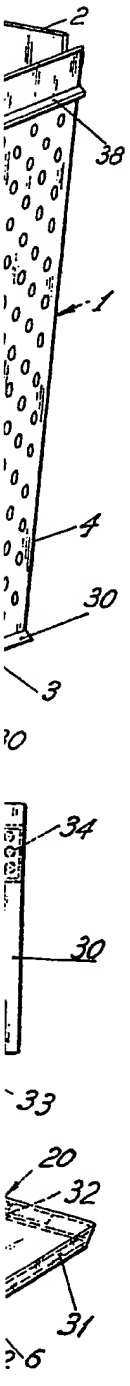


Fig.13

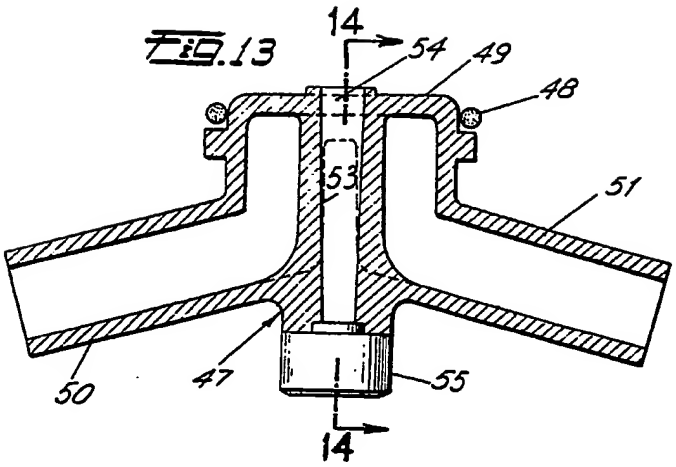


Fig.12

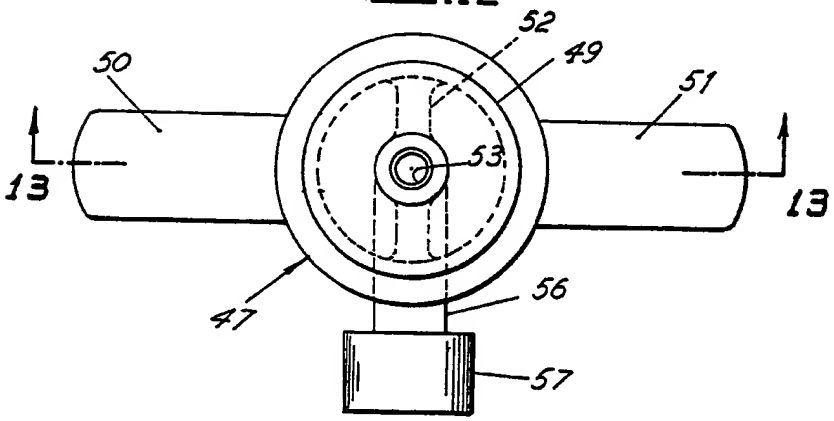
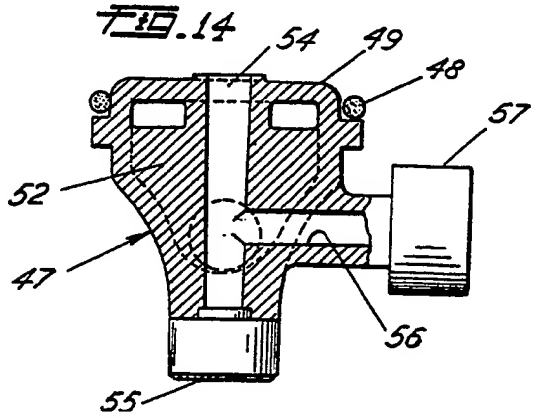


Fig.14



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3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 2 & 3

FIG. 6

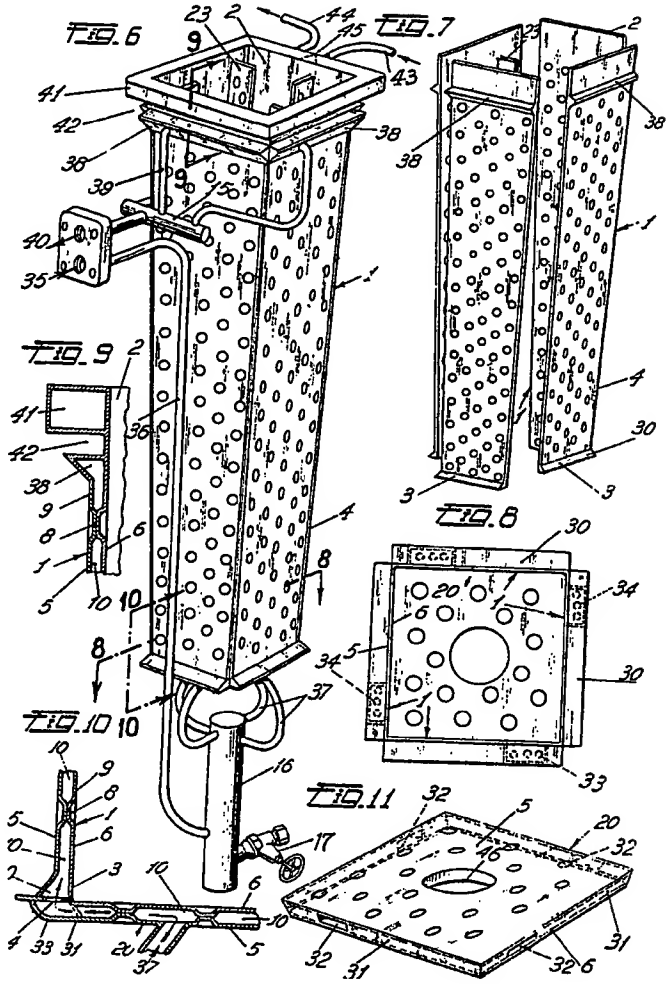

FIG. 7

FIG. 9

FIG. 8

FIG. 10

FIG. 11

FIG. 13

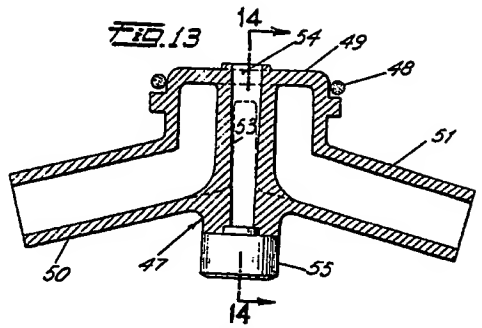

FIG. 12

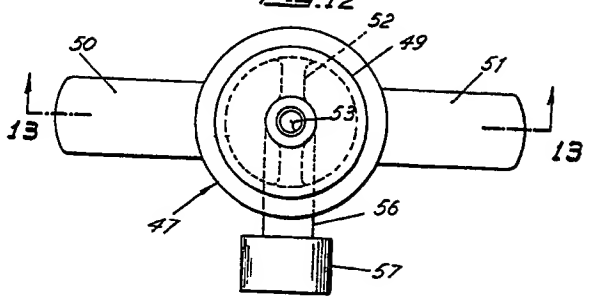

FIG. 14